UNIBEST Inc

Montana Manufacturing Extension Center

Innovation Sprouts from Soils Research; Mechanization with MEP

Client Profile:
Automating production is the latest step in the long road from research to commercial reality for an innovation developed by Earl Skogley, a soil scientist and entrepreneur, at UNIBEST Inc. (Universal Bioavailability Environmental/Soil Test), near Bozeman, Montana. The device is a cherry-tomato-sized capsule, filled with unique resin beads, that can change the way soils are analyzed. This technology allows direct measurements in the field, reducing the amount of material transported and handled in the laboratory. It simplifies and improves data collection for agricultural, environmental, and reclamation efforts in soils, water, or other media. The capsule is based on Skogley's doctoral research work on resins four decades earlier and shaped by his experiences as a Montana State University (MSU) scientist in the College of Agriculture. He retired from MSU in 1998 after 35 years of service. In addition to teaching duties, Skogley conducted research, primarily in soil fertility and crop nutrition, and conducted field plots all over the state of Montana. The Yellowstone National Park fires of 1988 provided some of the early field tests for the capsules, where the effects of forest burning were studied over two and a half years. Skogley and fellow researchers have spent years putting the resin capsules through the rigors of laboratory and field testing before more recent test marketing and mechanization phases. Skogley has built resources and partners to move the project forward including partners at UNIBEST International Corporation (UIC) in the Tri-Cities of the Columbia Basin in Washington State, where many high-value crops are intensively managed under irrigation.

Situation:
Market feasibility and large scale testing have been underway at UIC. The capsules are being used in high intensity agriculture for potatoes, sweet corn, alfalfa and other crops in Washington. They have been studied for several years with excellent results for use in rice paddys by the International Rice Research Institute in the Philippines. Field tests and marketing research have shown that using different resins gives the capsule great potential for use in hazardous waste and environmental reclamation efforts for both soils and water. Organic or inorganic materials can be collected, depending on the resin type. Between 300 to 400 resin types exist for scientific uses and practical applications. Until this year, the capsules were made manually, taking 30 hours to make 300 capsules. The PST-1 capsules for soil testing currently make up about 95 percent of UNIBEST manufacturing demand, but within a year Skogley predicts that will change, as he is working to obtain EPA approval of the technology for use in environmental monitoring. To learn how to scale up production cost effectively to meet expected demand and have solid data to submit for a "Growth through Agriculture" proposal to the Montana Department of Agriculture for mechanizing the process, Skogley naturally turned to the Montana Manufacturing Extension Center (MMEC), a NIST MEP network affiliate, situated at MSU.

Solution:

MMEC helped with preliminary design to automate the process of filling both sides of the capsule with resin and joining them together without losing the beads. MMEC also prepared cost estimates for the design and fabrication, a vital piece of data required by the loan application, and a list of potential design and tool-making firms. This information and a letter of support for the project helped complete documentation for a special low-interest loan of $50,000 toward automating production. A Montana firm was selected for the final design and manufacturing of the equipment now in operation. MMEC assisted the client with detail management during its production. The machine performs a fairly complicated 10-step process while balancing delicate temperature/time relationships. It cranks out 300 capsules in an hour. Two strips of plastic-mesh film are fed into two separate rotating tables of the machine and sliced into squares that are formed in heated, half-sphere molds. The half-spheres are filled with resin and a cover film is welded onto one. This one is turned over and welded onto the other to make a complete sphere. The welding is done using two ultrasonic welders that create enough heat at the point of contact to weld the plastic materials together. Excess film is trimmed in a press and the waste material blown by a puff of air into a receptacle. All of these processes occur automatically and simultaneously, increasing output 30-fold over manual production.

Results:

* Obtained a $50,000 low-interest loan from the Montana Growth through Agriculture program after submitting preliminary design and cost estimates and a letter of support from MMEC as part of a grant application.
* Invested $150,000 in automation equipment.
* Increased production capacity by 3,000 percent.
* Poised for expected surge in demand.

Testimonial:

"I'm not sure I could have reached this point without the prototype design work, support, and advisory capacity of MMEC. The Center helped me with contract and detail management while the machine was in development and made sure I was happy with the product -- that it was meeting my needs."
Earl Skogley, President